

Exploration and Practice of Mathematics Micro-major Construction in Finance-Oriented Universities

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Abstract: With the rise of competition in the world and continuous development of technology, the cultivation of compound talents for finance-oriented universities faces problems in mathematics teaching. At present, the development of mathematics minor programs in finance-oriented universities lacks research motivation, has only been superficially integrated with interdisciplinary courses, and does not have a strong digital intelligence resource platform. Shandong University of Finance and Economics is taken as an example, and in this paper, the construction path of mathematics minor majors suitable for finance-oriented universities based on three main ideas will be explored: "demand-driven", "interdisciplinary integration" and "digital intelligence empowerment". Through the development of the two micro-majors "Mathematical Foundation and Intelligent Knowledge Advancement" and "Mathematical Modeling and Intelligent Computing", a dual-track curriculum system of "foundation strengthening and advancement" and "modeling application" has been constructed, and a blended online-offline teaching model has been introduced to provide a practical reference for the innovation of mathematics talent cultivation models in finance-oriented universities.

1. Introduction

With the rise of globalization and changes in technology, many universities have reduced the length of their students' math classes in financial studies. How to integrate the foundation of mathematics, financial application ability and practical innovation ability organically has become an urgent problem to be solved in the cultivation of compound talents [1]. The new round of technological revolution and industrial transformation has ushered in a new economic wave of new technologies, new products and new business models. The urgency of deepening higher education reform is becoming increasingly obvious [2], and the old educational model urgently needs to be updated in order to foster all-round development of students. Micro-majors are a type of cross-disciplinary micro-curriculum system that has been used in over 40 universities, such as Tsinghua University and Peking University, and have shown good results in addressing the problem of educational supply-demand mismatch and promoting disciplinary intersection and talent cultivation model innovation [3]. Finance-oriented universities need to make good use of their

particular applied and service-oriented characteristics, and thus traditional advantageous disciplines should be transformed to serve the national strategic requirements and improve the foundational discipline capabilities [4]. Industry-characteristic high-level universities should take the advantageous characteristic disciplines as the leader, focus on improving the level of foundational discipline construction, and build a mutually beneficial disciplinary ecosystem; without first-class foundational disciplines, it is not very easy to cultivate first-class applied disciplines [5]. As one of the basis, the changes in mathematics education reform are very important. Promoting micro-major construction in mathematics can help promote deep cross-integration of mathematics and the finance-economics field, enhance students' practical skills in data analysis, financial modelling, etc., to meet the growing demand for versatile employment after graduation, and provide new practical paths for the model of university talent cultivation.

2. Literature Review

2.1 Concept and Connotation of Micro-majors

In 2013, Harvard University and MIT were the first to put forward the idea of micro-majors [6]. At the centre of this is to build course clusters with clear cultivation goals and internal logical connections around certain themes to meet the different learning and development needs of learners flexibly and accurately.

2.2 Current Research Status of Micro-major Construction

At present, research on micro-majors in China is still at an early stage, and the existing results have been mainly achieved in the areas of engineering, accounting and information management. Many good explorations have been made by scholars at the level of curriculum construction in various directions. Practices in the field of software engineering have shown that, to address the problem of professional curriculum design, systematic construction of micro-major curriculum systems is an effective way forward [7]. At the same time, micro-majors are also regarded as an excellent type of model that can meet people's needs for convenience and personalization in the face of changes in technology and individual study demands [8]. Based on actual cases, the construction practice of cross-border e-commerce micro-majors through cross-college and cross-major joint cultivation can nurture students' core position skills in 5-7 key courses to help them better adapt to the professional environment and meet the employment requirements of enterprises [9]. The combination of project-based and graded curriculum Design has also shown good results in terms of practical application for the implementation of micro-majors [10]. In terms of the mechanism guarantee, researchers have put forward that the high-quality construction of micro-majors should be based on multi-agent cooperation and systematic organization of teaching to integrate curriculum and faculty resources to ensure the quality of talent cultivation [11]. At the same time, to promote deeper integration and innovation among disciplines, it is necessary to clarify cross-disciplinary themes, objectives and curriculum systems [12].

3. Problems in Mathematics Micro-major Construction at Finance-Characteristic Universities

3.1 No-Demand Research

Micro-majors have a relatively small number of courses, and each course should have rich content and clear objectives in line with students' employment, further education and professional development needs. Without in-depth demand research, it is not easy to set up reasonable

micro-major courses. To make the research more applicable, a reverse mapping method of "position capability - course module - learning outcomes" can be used to meet the mathematical and computational requirements of new positions such as fintech, intelligent risk control, quantitative analysis, etc., and a dynamic update mechanism will be jointly developed with graduate schools and employers' feedback.

3.2 Superficial Disciplinary Intersections

Disciplinary intersection is not to add several courses together; rather, according to the development laws of frontier technology and the inherent construction logic of disciplines, it should be genuinely driven by changes in technology and society [13]. However, the currently offered content of micro-major courses is not in line with industrial requirements and is relatively superficial. The phenomenon of "intersection for the sake of intersection" is quite widespread and does not align with the objective of micro-major construction. Therefore, building good cooperation ties with the relevant departments is to be expected for realizing the goal of interdisciplinary teaching.

3.3 Weakness in the Construction of the Digital Intelligence Resource Platform

The Creation of learning resources should be interdisciplinary. Provide abundant and focused course materials, case studies, research projects, etc., to help students understand and apply knowledge better, boost their study motivation, and so on. At the same time, data on the learning process can be obtained from the Xuexitong platform, and learning analytics technology is employed to profile students' participation in learning, retention of knowledge, project results, etc., and targeted support and remedial resources are provided in line with the concept of "teaching determined by learning".

4. Micro-major Optimization Standards and Methods

Driven by the spirit of "demand-driven, disciplinary intersection, digital intelligence empowerment", and through exploration of how to build the two mathematics micro-majors at Shandong University of Finance and Economics - "Mathematical Foundation Strengthening and Intelligent Knowledge Advancement" and "Mathematical Modeling and Intelligent Computing", we have clarified the logical basis for the construction of mathematics micro-majors in finance-characteristic universities.

4.1 Optimization Objectives

Mathematics micro-majors are cross-disciplinary micro-curriculum systems set up by universities outside of the undergraduate major catalog to foster the general literacy and application ability of students in mathematics. They are used as carriers, have clear cultivation goals and inherent logical connections, aim to strengthen students' mathematical foundation, data analysis and modelling, etc., and meet the various learning and development needs of compound talents. Therefore, the exploration and practice of mathematics micro-major construction should be in line with the standards of the following five areas:

- (1) Focus on mathematics micro-major construction at finance-characteristic universities, explore and practice micro-major objective positioning and cultivation requirements, construct corresponding curriculum systems, and research talent cultivation organizational models.
- (2) "Demand-driven" teaching reform aligns with societal needs for compound talents,

improving student employment competitiveness through curriculum settings and teaching content optimization.

(3) The "disciplinary intersection" concept promotes deep integration between mathematics and disciplines like finance and economics, cultivating high-quality talents with diverse knowledge backgrounds and enhancing capabilities to solve complex problems.

(4) "Digital intelligence empowerment" utilizes modern information technology to improve teaching efficiency and learning effects, cultivate students' data analysis capabilities and innovative thinking, helping form a new professional education talent cultivation model that is more foundational, comprehensive, personalized, and practical based on general education and lifelong learning [14].

(5) Promote mathematics education reform and innovation, providing new ideas and practical examples for talent cultivation models at finance-oriented universities, enhancing education quality.

4.2 Optimization Methods

4.2.1 Research on Talent Demand

Based on the initial research and data analysis by the project team, we will focus on the following two micro-major construction issues: "Strengthening the mathematical foundation and advancing intelligent knowledge" aims to improve students' fundamental mathematical knowledge and integrate content for the progress of intelligent knowledge to enhance their logical thinking, problem-solving ability and study results; "Mathematical modelling and intelligent computing" aims to foster students' interdisciplinary application ability through the application of mathematical models and algorithms in the field of finance and economics.

4.2.2 Dual-track curriculum system of "foundation strengthening-advancement" and "modeling application"

Table 1: Curriculum Setting for Strengthening the Foundation of Mathematics and Advancing Intelligent Knowledge.

Course Name	Credits	Hours	Weekly Hours	Semester
University Mathematics Enlightenment Classroom I	2	32	2	Fall
University Mathematics Enlightenment Classroom II	2	32	2	Fall
Advanced Mathematics Intelligent Advancement	2	32	2	Fall
Linear Algebra Intelligent Application	2	32	2	Spring
Probability and Statistics Digital Intelligence Analysis	2	32	2	Spring
Mathematical Comprehensive Ability Enhancement	2	32	2	Spring

The curriculum structure of the "Mathematical Foundation Strengthening and Intelligent Knowledge Advancement" micro-major is shown in Table 1. By combining instruction and practice, it will strengthen the foundation of mathematics and introduce intelligent applications to lead

students from the basics of mathematics to intelligence. The curriculum organization of "Mathematical Modelling and Intelligent Computing" is as follows: Table 2 shows that there are 4 practical courses and 2 project guidance courses; together, they are designed to train students' abilities in constructing mathematical models using modern mathematical methods to solve real-life problems.

Table 2 Curriculum Construction for Mathematical Modelling and Intelligent Computing.

Course Name	Credits	Hours	Weekly Hours	Semester
Mathematical Foundations of Artificial Intelligence	3	48	4	Fall
Economic Statistical Methods and Practice	3	48	4	Fall
Economics and Management Mathematical Models and Practice	3	48	4	Spring
Artificial Intelligence Algorithms and Practice	2	32	4	Spring
Modern Mathematics and Economics	2	32	4	Spring
Modern Mathematics and Management	2	32	4	Spring

4.2.3 Form cross-disciplinary faculty teams

The "Strengthening of Mathematical Foundations and Intelligent Knowledge Advancement" minor will be taught by outstanding teachers in the foundation consolidation and innovation inspiration course. Teachers of the "Mathematical Modelling and Intelligent Computing" micro-major will be chosen from the group of teachers with a background in interdisciplinary research, especially those who have participated in the research on mathematical models for finance and economics and who have coached in innovation competitions.

4.2.4 Blended Online-Offline Teaching

All courses will be in the form of blended online-offline, and the online part will be organized through the Xuexitong platform. A six-dimensional teaching system of "teaching, supervising, learning, practicing, testing and tutoring" is employed to ensure the effectiveness of learning in all aspects, and "project checkpoint-style" teaching is used to motivate students' interest in learning by having them conduct research projects, innovation competition projects, etc.

4.2.5 Learning Resource Integration and Platform Construction

Create an Interdisciplinary Guided Project Platform. The basic knowledge learning platform can collect learning resources from some top courses. Construct a guide for the organization of offline practice activities.

5. Construction Practice of Mathematics Micro-major Based on "Demand-driven, Disciplinary Intersection, Digital Intelligence Empowerment".

Based on the concept of "demand-driven, disciplinary intersection, digital intelligence

empowerment" and drawing on the rich accumulation of professional training from the School of Statistics and Mathematics at Shandong University of Finance and Economics, we hope to establish two mathematics micro-majors: "Mathematical Foundation Strengthening and Intelligent Knowledge Advancement" and "Mathematical Modeling and Intelligent Computing" in cooperation with the Departments of Mathematics and Applied Mathematics and Financial Mathematics. Through the collection of employment data and questionnaire surveys to understand students' needs for employment and further study, we will clarify the objectives of micro-major cultivation, employ a blended online-offline teaching mode, construct a six-dimensional teaching system of "teaching, supervising, learning, practicing, testing and tutoring", integrate existing teaching resource platforms, build a cross-professional guided project practice platform, and explore construction paths for mathematics micro-majors that are suitable for finance-characteristic universities.

(1) Establish 2 mathematics micro-majors. By grasping student needs, improving existing curriculum systems, introducing cross-disciplinary courses, and attempting project-driven mathematics courses, we form a more scientific, reasonable, and practical mathematics micro-major curriculum system.

(2) Digital teaching resources. Utilizing digitalization technology and artificial intelligence technology, we improve digital teaching resources such as online courses and virtual laboratories, enhancing teaching effects and students' learning experiences.

(3) Practical teaching platform. Cooperating with enterprises or research teams to establish practical platforms, continuously updating practical topics, improving students' practical application capabilities and innovation abilities.

(4) Faculty capability enhancement. Through developing micro-major courses, cultivating and introducing teachers with multi-disciplinary knowledge and practical experience, improving the overall level of the faculty team, integrating science and education, and providing higher quality faculty resources.

6. Conclusion

Shandong University of Finance and Economics is the research object of this paper, and based on the three main ideas of "demand-driven", "disciplinary intersection" and "digital intelligence empowerment", problems in the current construction of mathematics micro-majors at finance-characteristic universities, such as a lack of demand research, superficial disciplinary intersection and weak digital intelligence resource platforms, will be addressed. We have explored the construction paths of Mathematics Micro-majors for finance-characteristic universities. Through the establishment of the two micro-majors of "Strengthening the Mathematical Foundation and Test-taking Skills" and "Mathematical Modelling and Intelligent Computing", we have built a dual-track curriculum system of "foundation strengthening" and "application", created a blended online-offline teaching model, and provided practical references for the innovation of the model of mathematics professional talent cultivation at finance-oriented universities.

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